

# Cleaning and Cleanliness Measurement of Additive Manufactured Parts

Mark A. Mitchell  
Materials Engineer  
EM50/Environmental Effects Branch  
Marshall Space Flight Center, NASA

Randy Raley  
Senior Materials Engineer  
EM50/Jacobs ESSSA Group

## Abstract

The successful acquisition and utilization of piece parts and assemblies for contamination sensitive applications requires application of cleanliness acceptance criteria. Contamination can be classified using many different schemes. One common scheme is classification as organic, ionic and particulate contaminants. These may be present in and on the surface of solid components and assemblies or may be dispersed in various gaseous or liquid media. This discussion will focus on insoluble particle contamination on the surfaces of piece parts and assemblies.

Cleanliness of parts can be controlled using two strategies, referred to as gross cleanliness and precision cleanliness. Under a gross cleanliness strategy acceptance is based on visual cleanliness. This approach introduces a number of concerns that render it unsuitable for controlling cleanliness of high technology products. Under the precision cleanliness strategy, subjective, visual assessment of cleanliness is replaced by objective measurement of cleanliness. When a precision cleanliness strategy is adopted there naturally arises the question: How clean is clean enough? The methods for establishing objective cleanliness acceptance limits will be discussed.